Problem A. Count

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

You are given three positive integers n, m, and k.

Your task is to calculate the total number of sequences A of length n that satisfy the following conditions:

1. All elements of A are integers from 1 to m(inclusive).

2. Let A_i be the i-th element of sequence A. For all positive integers i not exceeding k, it is satisfied that $A_i = A_{n-k+i}$.

Calculate the total number of such sequences A that satisfy the conditions and output the result modulo 998244353.

Input

The first line contains an integer $T(T \leq 1000)$, representing the number of test cases.

Each of the next T lines contains three integers n, m, and $k(1 \leq n, m, k \leq 10^{18}, k \leq n)$, representing the parameters for one test case.

Output

For each test case, output an integer representing the answer.

Example

standard input	standard output
1 11 2 1	1024

Problem B. Pair Sum and Perfect Square

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	512 megabytes

A permutation of n elements is an array of n numbers from 1 to n such that each number occurs exactly one times in it.

Given a permutation p of n elements, there are Q queries to be made.

Each query provides two integers L and $R (1 \le L \le R \le n)$, asking how many pairs (i, j) satisfy $L \le i < j \le R$ and $p_i + p_j$ is a square number.

A square number is the product of some integer with itself. For example, 9 is a square number, since it can be written as 3^2.

Input

The first line contains an integer $T (T \le 5)$, representing the number of test cases.

For each test case, the input consists of $Q + 3$ lines:

The first line contains an integer $n (1 \le n \le 10^5)$, representing the length of permutation p.

The second line contains n integers $p_1, p_2, ..., p_n (1 \le p_i \le n)$, representing the elements of permutation p.

The third line contains an integer $Q (1 \le Q \le 10^5)$, indicating the number of queries.

The next Q lines each contain two integers L and $R (1 \le L \le R \le n)$, representing the range of each query.

Output

For each query in each test case, output one line containing an integer, representing the answer.

Example

standard input	standard output
1 8 5 7 4 1 8 6 2 3 10 4 5 2 6 1 8 2 7 4 8 3 8 4 7 1 5 2 5 3 7	1 1 5 2 3 3 1 2 1 1

Problem C. Vector

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	64 megabytes

Given four three-dimensional vectors A_1, A_2, A_3, A_4, determine whether there exist non-negative real numbers x_1, x_2, x_3 that satisfy the following equation:

$$x_1 A_1 + x_2 A_2 + x_3 A_3 = A_4$$

Here, $A_i = (a_{i1}, a_{i2}, a_{i3})$ represents the components of the three-dimensional vector A_i.

For example, $A_1 = (3, 4, 4)$, $A_2 = (4, 3, 0)$, $A_3 = (2, 3, 2)$, $A_4 = (9, 10, 6)$ has a non-negative solution because $A_1 + A_2 + A_3 = A_4$.

Input

The first line contains an integer T $(1 \le T \le 1000)$, representing the number of test cases.

Each test case consists of a single line containing 12 integers in

$a_{11}, a_{12}, a_{13}, a_{21}, a_{22}, a_{23}, a_{31}, a_{32}, a_{33}, a_{41}, a_{42}, a_{43} (0 \le a_{ij} \le 10^4, 1 \le i \le 4, 1 \le j \le 3)$, representing the components of the four three-dimensional vectors A_1, A_2, A_3, A_4.

Output

For each test case, output a single line containing either "YES"or "NO indicating whether a non-negative solution exists.

If a non-negative solution exists, output "YES"; otherwise, output "NO".

Example

standard input	standard output
2 3 4 4 4 3 0 2 3 2 9 10 6 0 3 1 0 1 3 4 0 4 4 1 10	YES NO

Problem D. Tree

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	512 megabytes

Given a tree of n vertices and $n-1$ edges. Each vertex i has a color $c_i =$ 'a' or 'b' or 'c'.

Please count the number of simple path between i and j satisfy :

* $1 \le i \le j \le n$

* The number of vertices with three different colors is equal on the path.

Input

The first line contains one integer n ($n \le 10^5$).

The second line contains a string S with length of n . (S_i represents the color of i-th vertex,$S_i = \ 'a' \ or \ 'b' \ or \ 'c'$)

Each of the next $n-1$ lines contains a pair of vertex indices u_i and v_i ($1 \le u_i, v_i \le n$)— endpoints of the corresponding edge.

Output

Output an integer represent the answer.

Example

standard input	standard output
6 abbccb 1 2 1 3 1 4 1 5 4 6	5

Problem E. Meadow

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	512 megabytes

There is A $N \times M$ size meadow. For each location $(i,j)(1 \le i \le N, 1 \le j \le M)$, if $A(i,j) = 1$, it means that this location is planted with grass, and vice versa it means that this location is not planted with grass. If some location (i,j) is covered by a **grass − covered**(completely covered with grass) square area of size $L \times L$, the energy of the meadow will increase $L \times B(i,j)$ (the energy can be increased multiple times if a position covered by different square areas that meet the requirements).

You need to calculate the energy of the whole meadow.

Input

For the first line,input a positive integer $T(1 \le T \le 5)$, representing the total number of test data.

For each test data, input two positive integers n and m $(1 \le n, m \le 1000)$ in the first line, representing the size of the meadow.

The next n line, each m integer, input matrix $A(0 \le A_{i,j} \le 1)$, representing whether there is planted with grass in this position.

The next n line, each m integer, input matrix $B(0 \le B_{i,j} \le 10^5)$, representing the weight of each position.

Output

Output a line of a integer, representing the energy sum of the meadow, the answer may be large, need to modulus $10^9 + 7$.

"scanf" and "printf" are slower in this OJ and are not recommended for submission

Example

standard input	standard output
1 3 3 1 1 0 0 1 1 1 1 1 1 2 3 4 5 6 7 8 9	94

Problem F. Perfect square number

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1.5 seconds
Memory limit:	512 megabytes

You have an array of n elements a_1, a_2, ... , a_n.

You have an operation that can modify the value of a certain position to any of the values in $[1, 300]$.

Find the maximum number of intervals that satisfy the interval sum is a Perfect square number.

Input

Each test contains multiple test cases. The first line contains the number of test cases T ($T \leq 5$). The description of the test cases follows.

The first line contains one integer $n(1 \leq \ n \leq 300)$.

The second line contains n integers $a_1,\ a_2,\ ...,\ a_n(1 \leq a_i \leq 300)$.

Output

For each test case, output the maximum number.

Example

standard input	standard output
2 3 1 1 1 4 1 2 3 4	4 5

Problem G. Competition

Input file:	`standard input`
Output file:	`standard output`
Time limit:	12 seconds
Memory limit:	512 megabytes

You participated in a competition and you have a number V with an initial value of 0 and a score W with an initial value of 1. When you win the game, firstly $V = V + 2$, secondly $W = W * V$; when you lose the game, $V = V - 1$.

Now you only know that you have won n games and lost m games.

Please find the sum of W module 998244353 for all possible situations.

Two situations are considered different if and only if the winning/losing sequences are different.

Input

The first line contains two integers n, m.

$2 \le n \le 5 * 10^4, 1 \le m \le 10^5$

Output

Output an integer represent the answer.

Example

standard input	standard output
5 5	133035

Problem H. Alice and Bob

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	512 megabytes

Given an sequence of n elements a_1, a_2, ... , a_n.

Alice and Bob will play a game alternating turns with Alice going first.

If the current sequence length is n, select a position pos to divide the sequence into two part. If the sum of all elements from the first position to the pos position is less than the sum of all elements from the $pos + 1$ position to the last position, then delete the first element to the pos element. Otherwise, delete the $pos + 1$ element to the n element.

When the sequence length after a person's operation is 1, that person wins.

Alice and Bob both want to win. If they can, they hope the element in the final sequence bigger, otherwise they hope the element in the final sequence smaller.

Find the answer if both Alice and Bob play optimally.

Input

Each test contains multiple test cases. The first line contains the number of test cases $T (T \leq 1000)$ The description of the test cases follows.

The first line contains one integer $n (1 < n \leq 3000)$.

The second line contains n integers $a_1,\ a_2,\ ...,\ a_n(\ 1 \leq\ a_i \leq 10^9)$.

It's guaranteed that $\sum n \leq 10000$

Output

For each test case, first print "Alice"or "Bob"means who will win, then print an integer means the final sequence.

Example

standard input	standard output
3 3 1 2 3 4 1 2 3 4 5 1 2 3 4 5	Bob 2 Alice 3 Alice 4

Problem I. Coloration

Input file:	`standard input`
Output file:	`standard output`
Time limit:	10 seconds
Memory limit:	512 megabytes

For a connected undirected graph,where every vertex has a value, every edge has a unique weight. We define the **limit** of a path as the maximum edge weights of all edges on the path. The **limiting edge** between two vertexes $S(u, v)$ is the edge with the maximum weight in the path,and this path has to be with the minimum **limit** between two vertexes($S(u, v) = 0$ if $u = v$), and the value of $S(u, v)$ is uniquely certain for graphs with edge weights are different.

Define each edge of the limit set $T(w) = \{u|1 \leq u \leq n, \exists x : S(u, x) = w, val(u) \geq val(w)\}$ (x is a vertex) $val(u)$ represents the value of vertex u, $val(w)$ represents edge w weights.

Now you need to dye each vertex black and white, for the ith vertex, the cost of dyeing it black is a_i, the cost of dyeing it white is b_i, for each edge w_i, we need to satisfy that the number of black vertexes in $T(w_i)$ does not exceed x_i and the number of white vertexes does not exceed y_i.

What is the minimum dyeing cost if the conditions are met?

Input

The first line input a positive integer $(1 \leq T \leq 5)$, representing the number of test data.

For each test data:

In the first line, input two positive integers $n, m(1 \leq n \leq 1000, 1 \leq m \leq 2000)$, representing the number of vertexes and the number of edges in the graph.

In the next n row, the three positive integers $a_i, b_i, val(i)(0 \leq a_i, b_i \leq 10^5, 1 \leq val(i) \leq m)$represent the cost of dyeing the ith vertex black, the cost of dyeing the ith vertex white, and the vertex weight.

In the next m row, the three positive integers in each row $u_i, v_i, val(i)(1 \leq u_i, v_i \leq n(u \neq v), 1 \leq val(i) \leq m)$represent an undirected edge and its weight w_i.

The next line contains m integers $x_i(0 \leq x_i \leq m)$ represents the upper limit on the number of black vertexes in the limit set of i edges.

The next line contains m integers $y_i(0 \leq y_i \leq m)$ represents the upper limit on the number of white vertexes in the limit set of i edges.

Output

Output an integer representing the minimum cost of dyeing.

It is guaranteed that there is a method that meets the requirements and all edge weights are different.

Example

standard input	standard output
1 5 5 5 3 3 3 5 2 4 1 1 2 3 2 3 4 1 1 2 3 1 3 1 2 5 2 2 4 4 1 4 5 1 1 1 1 1 1 1 1 1 1	14

Note

For given example

$T(x)$represents the limited set of edges numbered x

$T(1) = \{1\}$

$T(2) = \{1, 3\}$

$T(3) = \{2\}$

$T(4) = \{\emptyset\}$

$T(5) = \{\emptyset\}$

The optimal solution is to dye vertex 3 white and the remaining vertexes black.

Problem J. Calculate

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	256 megabytes

Ming is on a map. There are n vertexes in the map. For each vertex, there is only one one-way edge that can reach another vertex on the map.

Ming has a number y in his hand, and when he reaches a certain vertex i, the number in his hand will change to $y \times k_i + b_i$.

There are several inquiries, each query Ming will start from a vertex x and walk l steps. At each step Ming starts from the current vertex and proceeds along the outgoing arc of that vertex to the next vertex. The initial number in his hand is y, and he wants to know what the number in his hand will become in the end.The answer is modulo $10^9 + 7$

Input

The first line, input a positive integer $T(1 \le T \le 5)$, representing the number of test data.

For each test, first line input a row of two positive integers $n, q(1 < n, q \le 10^5)$, representing the number of points in the map and the number of queries.

The next line inputs n positive integers $k_i(1 \le k_i \le 10^5)$ representing the value of k on each vertex

The next line inputs n positive integers $b_i(1 \le b_i \le 10^5)$ representing the value of b on each vertex

The next line inputs n positive integers $p_i(1 \le p_i \le n)$ represents the vertex reachable from vertex i, guaranteeing $p_i \ne i$.

The next q lines,each line has three positive integers $x_i, l_i, y_i(1 \le x_i \le n, 1 \le l_i \le 10^9, 1 \le y_i \le 10^5)$ for a query,x_i is the vertex where Ming started, l_i is the number of steps Ming took, and y_i is the number in Ming's hand.

Output

For each query, output a line with an integer representing the answer.The answer could be so large that you have to take mod $10^9 + 7$.

Example

standard input	standard output
1 5 5 2 3 1 2 4 3 4 2 1 2 2 3 5 1 4 1 2 4 2 4 5 3 3 4 4 5 2 5 2 1	18 125 77 221 9

Problem K. String

Input file:	`standard input`
Output file:	`standard output`
Time limit:	6 seconds
Memory limit:	512 megabytes

Alice and Bob are playing a string game.

Alice has a string S, Bob has a string T, in each round of the game, Bob will choose a string interval $T[l, r]$ in T , Alice needs to find a string interval $S[l', r']$ in S to make $T[l, r]$ is a substring of $S[l', r']$.

We define an interval of pairs $[l, r]$string S if and only if $1 \le l \le r \le S_{len}$($S_{len}$ is the string S length), all optional intervals of a string are all l, r that satisfy the condition. $S[l, r]$ is a string formed by concatenating the S string from the lth character to the rth character in order.

A string T is a substring of the string S if and only if the string T can be obtained by removing some characters from the beginning and the end of the string S (or not).

Both Alice and Bob find this game too boring, and they want to know if Bob randomly chooses one of all the intervals in the string T, how many intervals Alice can choose from the string S and such that the string selected by Bob is a substring of the string selected by Alice.

The game will be played multiple times, and in each round, Bob will change the string T, so you will need to answer multiple sets of questions.

Input

For the first line,input a positive integer $T(1 \le T \le 5)$, representing the total number of test data.

For each test data,the first line contains two positive integers $n, q(1 \le n, q \le 100000)$, which represent the length of the string and the number of queries.

The second line contains a string of length n representing the S string owned by Alice.

The next q lines, each line contains a string, representing the query string T.

It is guarantees that the length of all query strings does not exceed 10^6 in one test.

It is guaranteed that the input string contains only English lowercase letters.

Output

For each query, output a line with a positive integer representing the expected number, and the answer modulo 998244353.

Example

standard input	standard output
1 4 4 aaba a aa ab cab	9 7 332748124 166374062